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IN the course of his review of the reasons given by his predecessors for the earth's immobility, Aristotle states that "some" attribute it neither to the action of the whirl nor to the air beneath's hindering its falling:

> These are the causes with which most thinkers busy themselves. But there are some who say, like Anaximander among the ancients, that it stays where it is because of its "indifference" (ὁμοιότητα). For what is stationed at the center, and is equably related to the extremes, has no reason to go one way rather than another—either up or down or sideways. And since it is impossible for it to move simultaneously in opposite directions, it necessarily stays where it is.[1]

The ascription of this curious view to Anaximander appears to have occasioned little uneasiness among modern commentators. On the contrary, it has been accepted—quite justly, if it is to be accepted at all—as evidence for the early abandonment in Greek thought of the notion of an absolute up and down.[2] The only commentator, so far as I know, to reject outright Aristotle's ascription of this view to Anaximander is W. A. Heidel, who never developed at any length his reasons for doing so.[3] Nevertheless Heidel seems to be entirely in the right, and I propose to provide in this paper what I hope will be more solid grounds for rejecting the explicit testimony of Aristotle.

Let us begin by seeing what the passage asserts. It formulates the general principle that a body will stay put if two conditions are fulfilled: first, that it is "stationed at the center" of whatever contains it, and second, that it is "equably related to the extremes" of that container. A body in this state is ὅμοιος. It is further implied that the earth is a body that fulfills these conditions, and that this is the reason why it does not move out of its place.

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The meaning of the first condition seems clear enough. If the earth is the body in question, and what contains it is the οὐρανός, then "to be stationed at the center" will mean "to be equidistant from every point on the circumference of the οὐρανός." The second condition is fulfilled when the earth is "equably related to the extremes" of the οὐρανός, but we are not told in what respect it must be equably related to them. For further light on this point we must turn to the account of the matter given by Hippolytus, who is drawing on what may be supposed to be Theophrastus' version of our passage. According to this account, Anaximander held that the earth is suspended in mid-air "by reason of its equidistance from all things (διὰ τὴν ὁμοίαν πάντων ἀπόστασιν)."[4] It is difficult to see what "all things" can refer to unless to all points on the circumference of the οὐρανός; otherwise the explanation would entirely lack plausibility. On the other hand, if this is all that the passage asserts, it is evident that the second condition adds nothing to the first. All that is necessary is that the earth be located at the center.

Now, what was the immediate source upon which Aristotle was drawing for the formulation of this view? It is, I think, evident that he was drawing upon certain passages in the *Phaedo* and in the *Timaeus* in which we find Plato putting forward a very similar view. The evidence for this is clear enough from an examination of the language of the passage in the *De Caelo*, the similarity of which to the language of the dialogues has not failed to catch the attention of commentators.[5] But the similarity is not merely verbal. In the *Phaedo* once more we have the earth's immobility offered as a particular case of a general principle, namely that "a thing which is in equilibrium and placed in the center of something homogeneous (ὁμοίου) will not incline in one direction rather than another, but being equable (ὁμοίως δ' ἔχον) will remain steady (ἀκλινές)."[6] The earth, being spherical, *is* in equilibrium; and, being placed at the center of the οὐρανός, which is uniform, it does not move in any direction.

But it is not quite clear what is meant by the "uniformity of the heavens" (ὁμοιότητα τοῦ οὐρανοῦ). As Burnet has pointed out, ὁμοιότης cannot refer to homogeneity of substance or density, for the world is not homogeneous in substance.[7] But if this is so, the word must refer to the space itself which is taken up by the οὐρανός, and by the "uniformity of the heavens" will be meant, then, merely its equidistance in every direction from the earth taken as a center. To say this, however, is simply to repeat in another form what has already been stated, namely that the earth is situated in the center. As we have seen, Aristotle preserves this

redundancy by saying that the earth must not only be located at the center but must also be equably related to the extremes. It is unnecessary, I think, to labor this point further, for a number of modern commentators have already expressed either openly or by implication their belief that Plato is the immediate source of Aristotle's formulation of the view he attributes to Anaximander.

That Aristotle drew his formulation of the view from Plato does not, of course, prove that the view itself was not held by Anaximander. But neither is there any indication, either in the *Phaedo* or the *Timaeus*, that Plato drew his account from Anaximander. Aristotle is our *sole* evidence for the existence of the view prior to Plato. Hippolytus, of course, ascribes the view in question to Anaximander; and Aëtius, in a passage we shall deal with presently, ascribes a similar view to Parmenides and Democritus. But it is almost certain that they do not speak from first-hand knowledge, and that their information comes from Theophrastus, and so ultimately from Aristotle. The passage in the *De Caelo*, then, which is before us, constitutes the only direct evidence we have for the belief that Anaximander dealt with the problem of the earth's immobility in this way.

We may now turn to the evidence against Anaximander's having held the view imputed to him by Aristotle—evidence supplied in large measure by Aristotle himself in other passages in the *De Caelo*.

A little consideration will show that this theory of the earth's immobility is founded upon the supposition that the earth has no absolute weight, that is, that it has no natural tendency to fall. According to Aristotle, the earth, because of its equidistance from the extremes, will move neither sideways *nor up or down*. The possibility of the earth's moving upward we may ignore; this does not appear to have presented itself as a problem to any of the Presocratics. But the possibility of its falling down presented them with a very acute one; for these thinkers, unlike Plato, thought of the earth as having weight, and therefore as requiring some sort of support. Aristotle himself is evidence for the preoccupation of earlier thinkers with this problem, and it is clear from his account that most of them supposed the earth to be supported by air:

> Anaximenes, Anaxagoras and Democritus say that the flatness of the earth is the cause of its staying where it is; for it does not cut the air beneath it but covers it like a lid. This seems to be the way of flat-shaped bodies; it is difficult even for the wind to move them because of their power of resistance. The same immobility, they say, is produced by the flatness of the surface which the earth presents to the air which lies beneath it.[8]

Similar statements in the doxographers and even in the medical writers attest to the presence of a single tradition in early cosmology: the belief that the earth is absolutely heavy and requires support.

The only apparent exception to this view (aside, of course, from the passage in the *De Caelo* whose accuracy is in dispute) appears in a statement by Aëtius: "Parmenides and Democritus say that the earth, being equidistant in every direction, remains in equilibrium, having no reason to fall one way rather than another; hence though it quakes it does not move."[9] The idea is the same as that expressed in the report of Aristotle: the earth, being equidistant in every direction from the οὐρανός, remains balanced. Being no more inclined to move one way than another, it does not move at all.

Now we know to start with that this report is quite false so far as it concerns Democritus, for we know that Democritus regarded the earth as flat, and we know from Aristotle's own account that those thinkers who held the earth to be flat did so because the immobility of the earth—specifically its failure to fall—necessarily involved its being flat.[10] That is, it is only on the basis of its being flat that we can account for the earth's staying up by riding upon the air. But why need the problem of the earth's support arise at all unless it is because the earth is thought of as absolutely heavy? And if the earth *is* heavy, then clearly there *is* a reason for Democritus why the earth should fall one way (*i.e.*, down) rather than another, and Aëtius' report must be erroneous.

Whether Aëtius correctly attributes this view to Parmenides is more difficult to decide because of the slightness of our knowledge of the details of Parmenides' cosmology. Nevertheless, we have enough information to allow us to draw conclusions that are highly probable, and these make it unlikely that Aëtius' report can be trusted.

What is important for our purposes, as the above consideration of Democritus has shown, is the shape of the earth in Parmenides' cosmology. We have two pieces of evidence bearing on this, both of which come from Diogenes Laertius. In his life of Parmenides, Diogenes states that "he was the first to represent the earth as spherical (σφαιροειδῆ) and as situated in the middle."[11] But elsewhere he gives a rather different account. We are told, he says, that Pythagoras was "the first to call the heavens a cosmos and to describe the earth as στρογγύλη; but Theophrastus says that Parmenides was the first to do this."[12] The first of these statements is of little value. Diogenes uses the same word, σφαιροειδῆ, to describe the earth of Anaximander, which we know to have been flat.[13] Moreover, the assertion that Parmenides was the first to

place the earth in the center is contrary to all the evidence. Of more importance is the second account, which comes from Theophrastus and implies that Parmenides himself used the word στρογγύλη to describe the shape of the earth. The majority of the commentators take στρογγύλη to mean, here, "spherical" as opposed to "flat" (πλατεῖα)—apparently on the ground that the words στρογγύλη and πλατεῖα are used as antonyms in the *Phaedo*.[14] But passages from other authors might be cited to the contrary. The author of the "Hippocratic" treatise *Head Wounds*, for example, writing toward the end of the fifth century, distinguishes between weapons that are στρογγύλα and weapons which are περιφερέα, though περιφερής is the word which Plato himself uses in the *Phaedo* to describe the spherical earth.[15] "It is certain," as Heidel has pointed out, "that in the fifth century the term in question was not used exclusively or even generally with reference to a sphere."[16] On the other hand, it *is* frequently used in connection with a cylindrical shape.[17] Hippolytus, for example, describes the earth of Anaximander as στρογγύλον, κίονι λίθῳ παραπλήσιον: "round, like a stone column."[18] The word is used again to describe the earth of Diogenes of Apollonia, which was almost certainly disk-shaped.[19] Thus in both cases where the term is used to describe the shape of the earth in connection with earlier thinkers it has the same meaning. There is no reason to suppose that it had a different meaning as applied to the earth of Parmenides. On the contrary, the fact that Parmenides uses σφαῖρα to describe the sphere of being and στρογγύλη to describe the earth suggests *prima facie* that he distinguished between the use of the two words. The likelihood that Parmenides did treat the earth as a flat disk is increased by Aëtius' description of the earth as the midmost of a series of concentric rings, unique only in being solid—a way of speaking that strongly suggests that it is shaped like a disk.[20] If this is true, then there is good reason to believe, arguing upon the lines pursued above in connection with Democritus, that Parmenides regarded the earth as heavy; and this is confirmed by the statement of Pseudo-Plutarch that "the earth arises from the sinking down of the dense"—the "dense" being the heavier part of the original mixture.[21] But if Parmenides thought of the earth as heavy, it is clear that he could not have supposed, any more than Democritus, that there is no reason for the earth to move one way (*i.e.*, downwards) rather than another.

I have been at pains to establish the fact that all our evidence points to the existence of a single tradition among the earliest thinkers, one presupposing that the earth has absolute weight, and accounting for its support by imagining it to be flat. That Anaximander belonged to this

tradition is not difficult to establish; indeed had he departed from it in the manner imputed to him by Aristotle, the failure of succeeding thinkers to comment upon the fact would be completely inexplicable. We know that before Anaximander Thales thought of the earth as heavy, for he felt obliged to explain its staying up by supposing that it floated upon water.[22] That Anaximander followed him in thinking of it as heavy is evident from the fact that in accounting for the disposition of the parts of the cosmos he makes use of the same process of separation (ἔκκρισις, ἀπόκρισις) which subsequent thinkers make use of in accounting for the coming together of the heavier elements at the center and the lighter at the periphery.[23] It was for this reason that, like Thales before him, he was faced with the problem of the earth's support—a problem which he was obliged to solve (following the line of thought so succinctly indicated by Aristotle himself) by conceiving it as a flat disk, a cylinder having a depth one-third its breadth.

On the basis of this evidence I hold that the view imputed to Anaximander by Aristotle not only *was* not but *could* not have been held by him. Simplicius, aware of the impossibility of fastening such a view upon Anaximander, departs so far from Aristotle as to say that Anaximander attributed the immobility of the earth "*both* to the air's holding it up *and* its equilibrium and 'indifference.' "[24] Consider for a moment the significance of this statement. We have in it the first suggestion that the problem of the earth's immobility is not a simple but a complex problem. On the one hand there is the problem of the earth's *support*—of explaining why it does not fall; on the other there is the problem of the earth's lateral fixity—of explaining why it is that the earth does not move to one side or another. Much of the confusion in Aristotle's discussion in the *De Caelo* springs from the fact that he fails to realize that these are two entirely different problems. For example, in the midst of a discussion of why the earth does not fall, he ascribes to Empedocles the view that "it is the swiftness of the motion of the heaven as it swings around in a circle that prevents the earth from moving."[25] He is speaking here of those thinkers who attribute the earth's position at the center to the vortex (δίνη); "for all of them say that this is the cause, arguing from what happens in liquids and in air, where the larger and heavier things always travel to the center of a vortex. Hence all who hold that the heaven came into being say that the earth travelled to the center for this reason."[26] Now it is evident from this context that Empedocles can only have meant to explain in this way why it is that the earth does not move *sideways*, *i.e.*, in the plane of the whirl. Being heavy,

it is carried to the center and held there by centripetal force. But the whirl does not prevent the earth from falling, and Empedocles recognizing this, supplied an additional cause for its being held aloft by supposing, with his predecessors, that it is flat.[27] Aristotle mistakenly thinks of Empedocles as representing a tradition other than that represented by Anaximenes, Anaxagoras and Democritus, regarding the cause of the earth's immobility, because he fails entirely to see that for earlier thinkers there were *two* problems involved: one of explaining why it does not move sideways, and quite another of explaining why it does not fall.

We have seen that earlier thinkers met the latter problem by imagining the earth to be supported from below, either by water (in Thales' case) or by air; and we have seen that according to Aristotle himself *all* of them accounted for the earth's lateral fixity by making use of the whirl as a principle of explanation sufficient not only for the original separating-out of the light from the heavy but also of the continuing maintenance of this separation. In the fragmentary accounts which we have of Anaximander's thought there is ample evidence of his having made the same sort of use of the whirl as a principle of explanation as we find in later thinkers.[28] We have, therefore, to regard with equal suspicion Aristotle's account of Anaximander's views even with regard to the problem of the earth's lateral fixity.

At the same time it is perhaps a little easier to see how Aristotle could have come to the mistaken conclusion that Anaximander held the view ascribed to him in the *De Caelo*. An earth held in the grip of the vortex would *in fact* be in a condition of ἰσορροπία or ὁμοιότης in as much as it would be driven in upon the center with equal force from all sides; and it would be equidistant from all points on the periphery of the vortex for the same reason. A poetically worded reference to this state of affairs could very easily have been misconstrued by Aristotle as a *causal* account of the earth's immobility.[29] Whether this is what happened we have, of course, no way of knowing; but it seems to me clearly impossible in the face of the available evidence to take seriously Aristotle's ascription of the view of the *Phaedo* and the *Timaeus* to Anaximander.

NOTES

[1] Aristotle *De Caelo* II. 13, 295b 10 ff. I have followed Stocks and Burnet in rendering ὁμοιότης as "indifference." The word suggests better than "likeness" or "similarity" the dynamic aspect of the situation.

[2] See most recently Charles H. Kahn, *Anaximander and the Origins of Greek Cosmology* (New York, 1960), pp. 76 ff. I have discussed Kahn's

acceptance of Aristotle's testimony in a review article, "The Framework of Greek Cosmology," *RM*, XIV (1961): 676–84.

[3] W. A. Heidel, "The δίνη in Anaximenes and Anaximander," *CP*, I (1906): 279–82; see also *The Frame of the Ancient Greek Maps* (New York, 1937), pp. 68–69.

[4] Hippolytus, *Ref.* i.6 .3 (DK 12 A 11).

[5] See, for example, Stocks' note on *De Caelo* II. 13, 295b 12 in the Oxford translation. Stocks rightly points out that although Aristotle borrows the language of the *Phaedo* his understanding of it was faulty.

[6] Plato *Phaedo* 108E–109A. Cp. *Timaeus* 62D–63A.

[7] John Burnet, *Plato's Phaedo* (Oxford, 1911), note on *Phaedo* 109A6.

[8] Aristotle *De Caelo* II. 13, 294b 13 ff.

[9] Aëtius iii. 15. 7 (DK 28 A 44).

[10] Aëtius iii. 10. 5 (DK 68 A 94) and Aristotle *De Caelo* II. 13, 294a 9 ff.

[11] Diogenes Laertius ix. 21 (DK 28 A 1).

[12] Diogenes Laertius viii. 48 (DK 28 A 44).

[13] Diogenes Laertius ii. 1 (DK 12 A 1). Cp. [Plut.] *Strom.* 2 (DK 12 A 10) and Hippolytus *Ref.* i. 6. 3 (DK 12 A 11).

[14] Plato, *Phaedo* 97D.

[15] *On Head Wounds* iii. 24 Withington. Plato, *Phaedo* 108E. For the date of *Head Wounds*, see Withington in the Loeb *Hippocrates* iii, xxv.

[16] W. A. Heidel, *The Frame of the Ancient Greek Maps* (New York, 1937), p. 74.

[17] Theophrastus, for example, in his *History of Plants* (v. 6. 5) describes unsquared logs as ξύλα στρογγύλα. In another place (*History of Plants* vii. 4. 5) he speaks of a certain plant as στρογγυλόκαυλον: "having a round stalk." In both cases the reference is to something cylindrical.

[18] Hippolytus *Ref.* i. 6. 3 (DK 12 A 11).

[19] Diogenes Laertius ix. 57 (DK 64 A 1). Cp. John Burnet, *Early Greek Philosophy* (London, 1930), p. 357.

[20] Aëtius ii. 7. 1 (DK 28 A 37).

[21] [Plut.] *Strom.* 5 (DK 28 A 22).

[22] Aristotle *De Caelo* II. 13, 294a 28.

[23] As W. A. Heidel observes ["The δίνη in Anaximenes and Anaximander," *CP*, I (1906), 281] "the whole range of Greek philosophy connects ἀπόκρισις and ἔκκρισις with the δίνη."

[24] Simplicius *De Caelo*, 531–32.

[25] Aristotle *De Caelo* II. 13, 295a 17.

[26] Aristotle *De Caelo* II. 13, 295b 10 ff.

[27] So much is clear from Aëtius ii. 8. 2 (DK 31 A 58). The "tilting" referred to here and in connection with other thinkers (*e.g.*, Aëtius iii. 12. 2 [DK 68 A 96] for Democritus) implies a flat earth.

[28] For the rôle of the δίνη in the thought of Anaximander and his successors I would refer the reader to my *Introduction to Early Greek Philosophy* (Boston, 1968), Index, *s.v.* "Vortex."

[29] That Anaximander expressed himself in "somewhat poetical language" we know from Simplicius *Phys.* 24. 18 (DK 12 B 1).